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ABSTRACT

Basic and integrated science process skills form the basis for inquiry-based, hands-on learning. This study explores conditions that are essential for students to master the process skill of prediction. The following question is asked: Is there a significant difference between kindergarten students' prediction ability using hands-on objects exclusively, hands-on objects and interactive videodisc (IVD), or using IVD only? Three treatments were involved: (1) students who used the interactive videodisc only (blue group); (2) students who handled objects while determining if they sink or float using an interactive videodisc (pink group); and (3) students who used objects at a water table only (white group). Fourteen objects were used: a small rock, a large rock, a ping pong ball, a piece of aluminum foil, a wad of aluminum foil, a metal nut, a plastic fork, a metal fork, a crayon, a small cork, a large cork, a piece of wood, a small coin, and a large coin. Results showed that the blue group of 13 participants had a mean of 9.07 correct predictions; the pink group of 12 participants had a mean of 8.6 correct predictions; and the white group of 13 participants had a mean of 10.9 correct predictions. Analysis of variance (ANOVA) revealed no significant difference at the .05 level. Post-hoc analysis using the least significant difference (LSD), revealed a difference between the white and pink treatment groups only. An additional ANOVA was done with one piece of datum removed, which revealed a significant difference among groups. The hands-on treatment group (white) was superior to the other two groups. Study limitations are discussed and suggestions are provided for further. Two tables and three figures illustrate data. (Contains eight references.) (MAS)

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ED 386 170

The Use of a Science Interactive Videodisc in an Early Childhood Classroom

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IR017298

The Use of a Science Interactive Videodisc in an Early Childhood Classroom

Introduction

Basic and integrated science process skills form the basis for inquiry-based, hands-on learning. These skills enable students, in the future, to ask questions, form hypotheses, identify variables, develop questions, and recognize the answers as a final product and a starting point for further study (Nagalski, 1980). "Through inquiry experiences, students not only learn about science, but they also learn skills that help them to think logically, ask reasonable questions, seek appropriate answers, and solve daily problems." (p. 794) (German, 1994).

Prediction is one of the basic process skills appropriate for kindergarten children. The debate is: are hands-on experiences required for students to master this process skill? Butts, Hofman & Anderson (1993) posed this question in a research study involving five and six year-old children and their ability to predict whether certain objects sink or float. "The evidence supported a conclusion that direct experiences coupled with instructional conversations are essential to helping children change their view of sinking and floating objects." (p. 50).

Since the introduction of interactive video (IV), the interactive videodisc (IVD), and accompanying computer software into educational and training settings, many researchers have conducted various studies on the usefulness of this type of medium. These studies have produced a wide variety of results concerning the effectiveness of IV and IVD. McNeil and Nelson (1990), in conducting a meta-analysis of 63 studies of the effect of IV on cognitive achievement, found that "conclusions from reports are generally positive yet cite inconsistent and contradictory findings." (p. 5). Other studies show significant gains using IV for example, Ives (1989) states in citing DeBloois (1988) that a review of 30 evaluation studies of IVD training programs revealed that "comprehension gained through IV is at least as comparable and often greater than classroom training and it frequently occurs in less time and at a lower expense." (p. 2). Also, IV use has

been implicated as being a partial solution to the problem of effective teaching of difficult subjects (Woodward and Gersten, 1988).

While there have been a limited number of studies regarding the sinking and floating of objects, Frenette (1988) focused on learners considerably older than kindergarten students and involved interactive computer programs, not IV, which provided the simulations of sinking and floating objects. The study was primarily concerned with producing changes in the reasoning that forms the basis of the sink/float predictions of children. It was hypothesized that evidence to counter the predictions made by children would cause them to realize their errors in reasoning and change their predictive reasoning. The computer programs used were shown to be effective in the short term in producing better critical thinking skills, but ineffective in improving children's predictions of sinking and floating behavior. Frenette stated that "further study of the role" of interactive computer programs as well as live instructions "in bringing about long term change is warranted using more extensive teaching interventions. . . ." (p. 59).

Thus, is it possible for children to hasten their mastery of the basic process skill, prediction, through the use of an interactive videodisc? Do young students require the use of hands-on objects or can they learn equally as well through a vicarious experience. Or can kindergarten students master this skill with the handling of the objects and support of the IVD?

Statement of the Problem

To explore conditions that are essential for students to master the process skill of prediction, the following question is asked:

Is there a significant difference between kindergarten students' prediction ability using hands-on objects exclusively, hands-on objects and IVD, or using IVD only?

Method

This pilot study used a post test only design. There were three treatments involved: students who used the interactive videodisc only (Blue), students who handled objects while

determining if they sink or float using an interactive videodisc (Pink), and students who used objects at a water table only (White). (See Appendix A) Analysis of Variance (ANOVA) was used to determine if significant differences existed between treatment groups. The post-hoc analysis selected was the Least Significant Difference (LSD). A null hypothesis was established prior to the investigation.

There were 14 objects used in all treatment groups. These objects were: small rock, large rock, ping pong ball, a piece of aluminum foil, a wad of aluminum foil, a metal nut, a plastic fork, a metal fork, a crayon, a small cork, a large cork, a piece of wood, a small coin, and a large coin.

Students involved in the study were enrolled in three kindergarten classes from one school. The school serves a middle class neighborhood with racial balance similar to that of the city. The sample consisted of 21 females and 18 males. Classes were randomly assigned to treatment groups.

Results

The number of children in the Blue group was 13 with a mean of 9.07 correct predictions. The number of children in the Pink group was 12 with a mean of 8.6 correct predictions. The number of children in the White group was 13 with a mean of 10.9 correct predictions.

Analysis of variance (ANOVA) revealed no significant difference at the .05 level. (See Figure 1) Post-hoc analysis, using the Least Significant Difference (LSD), revealed a difference between the white and pink treatment groups only. (See Table 1)

An additional ANOVA was done with one piece of datum removed. There was then a significant difference revealed between the treatment groups. (See Figure 2) Post-hoc analysis, using the LSD, again revealed only a significant difference between the white and pink treatment groups. (See Table 2)

Discussion and Implications

The results from this study are similar, although not identical to Frenette (1988); Woodward and Gersten (1988); Ives (1989); and Butts (1993). Manipulation seem to be essential at this young age. The mastery of this process skill of prediction will aid students in the future when dealing with sophisticated science experiments. The differences found in these studies could be attributed to the fact that older children were involved as compared with kindergartners in this study.

The limited sample size used in this study leads to the following implications. The hands-on treatment group (White) was superior to the other treatment groups (Blue and Pink). This is not to imply that the use of a videodisc as a teaching strategy is not appropriate at the kindergarten level. After observing children in the various treatment groups, the sample from the Pink group was involved with two monitor screens plus the hands-on objects. This was deemed too many distractions by the researchers. This may have lead to a lower level of predictive ability.

Further research should be done with other process skills utilizing IV and IVD. Different ages, SES, gender, and educational background should be considered in any future research.

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Table 1

ANOVA and Post-hoc Analysis with all Data

ANOVA for Scores

Source	df	Sums of Squares	Mean Squares	F-ratio	Probability
Const	1	3486.74	3486.74	488.44	≤ 0.0001
Group	2	36.7503	18.3752	2.4687	0.0993
Error	35	260.513	7.444322		
Total	37	297.263			

LSD Post Hoc Tests

	Differences	Standard Error	Probability
Pink - Blue	-0.410256	1.092	0.709455
White - Blue	1.84615	1.070	0.046293

Table 2

ANOVA and Post-hoc Analysis minus one Datum

ANOVA for Scores

Source	df	Sums of Squares	Mean Squares	F-ratio	Probability
Const	1	3502.70	3502.70	570.94	≤ 0.0001
Group	2	56.7076	28.3538	4.6216	0.0168
Error	34	208.590	6.13499		
Total	36	265.297			

LSD Post Hoc Tests

	Differences	Standard Error	Probability
Pink - Blue	-0.410256	0.9916	0.918163
White - Blue	2.42308	0.9916	0.063875
White - Pink	2.83333	1.011	0.029249

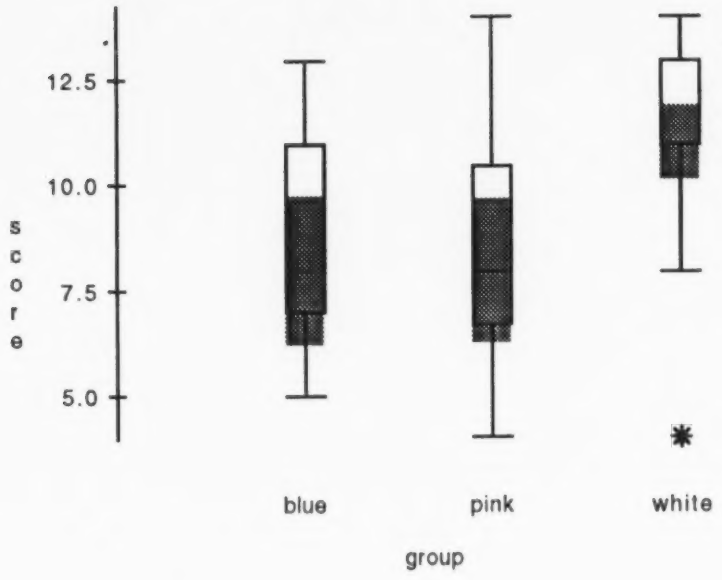


Figure 1 Boxplot of ANOVA with all data

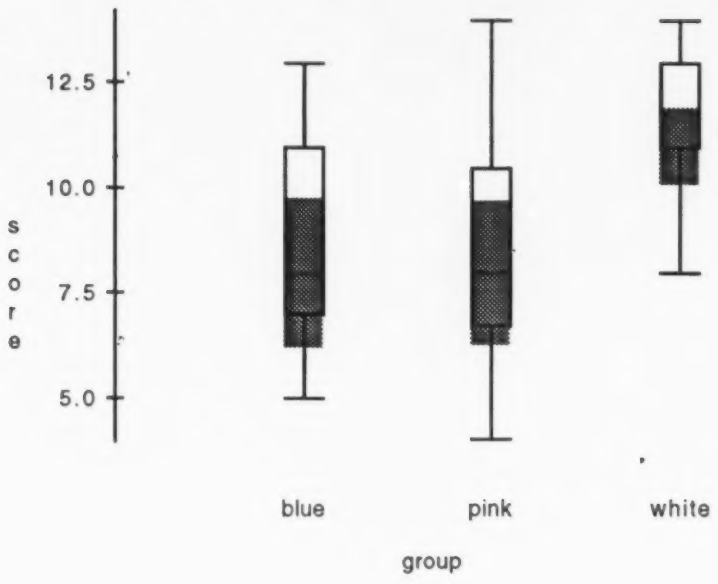
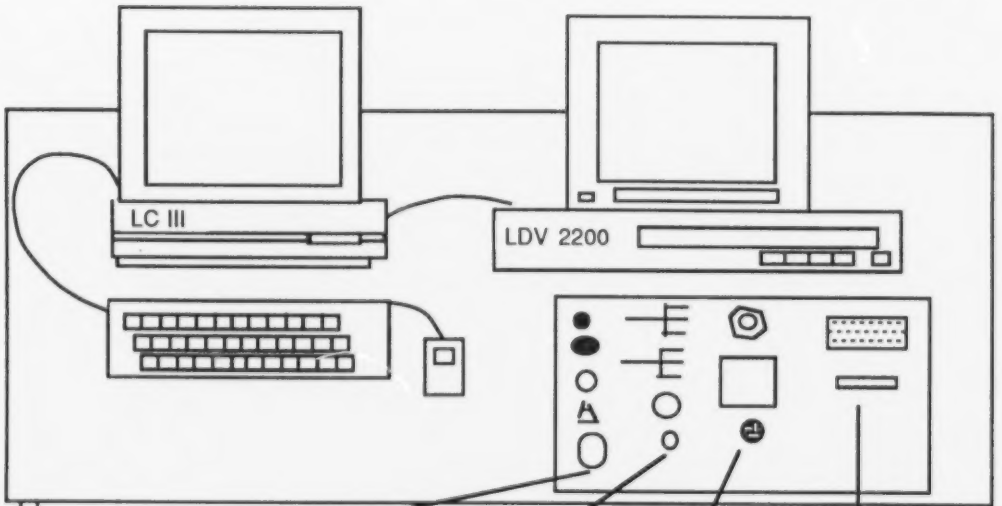


Figure 2 Boxplot of ANOVA minus one datum

Appendix A

Level 3 Videodisc Application

Pink



Objects:

Small rock
Large rock
Ping pong ball
Small cork
Large cork

Plastic fork
Metal fork
Large coin
Small coin

Piece of metal
Piece of foil
Wad of foil

Piece of wood
Crayon

Blue - same setup without the hands-on objects

White - hands-on objects only